Method of Percutaneous Endotracheal Catheterization

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• **The accumulation of tracheal secretions is frequently due to the reluctance of a postoperative patient in severe pain to aggravate the pain by coughing.**

The intermittent instillation of a saponifying agent through an indwelling catheter inserted percutaneously has proved to be effective in clearing pulmonary secretions by producing a strong reflex cough.

Complications with this technique were few. It is not painful and can be done quickly and easily.

The Bardic Deseret Intracath unit, although devised for intravenous infusion therapy, is admirably suited to this technique.

INTERMITTENT positive pressure aerosol therapy, widely used as a postoperative adjunct, offers considerable protection against the development of broncho-pulmonary complications. The treatments expand the pulmonary parenchyma and help loosen retained mucopurulent plugs, but since the secretions must still be expelled from the respiratory tree, an effective cough is necessary. Certain patients are reluctant to cough well, because of pain or temperament, and even liquefied materials may continue to accumulate. We use a simple technique that promotes expulsion.

METHOD

Direct tracheal irritation brings about strong involuntary reflex coughing needed to expel endobronchial accumulations. Our method does this without the unpleasant side effects of nasal or oral catheterization. Other investigators[1,2,3] have reported passing segments of plastic tubing into the trachea through a separate puncture needle. We use the Bardic Deseret Intracath* intravenous catheter placement unit because of its suitability and wide availability in an immediately usable sterile packet. The 1514-19 model series has proven most efficient and the largest size, model 1514, equipped with a fourteen gauge needle and an eight inch length of plastic tubing, is best adapted to the present use.

The catheter is introduced into the trachea as follows: At the site to be punctured—overlying the trachea and approximately four centimeters above the suprasternal notch—the skin is infiltrated with a local anesthetic agent. The fingers of the left hand straddled the larynx and adjacent trachea, immobilizing them and locating the anterior tracheal surface. With the right hand the Bardic Deseret needle is inserted and, tilted slightly toward the thorax, is advanced into the soft tissue of the neck (Figure 1). We make no special effort to enter the trachea at the level of the crico-thyroid membrane. A sensation of resistance, followed by a sudden "give," signals the entrance of the needle into the trachea. The plastic tubing is then passed through the needle and down the trachea. It should slide forward without resistance and its entrance into the trachea should cause coughing. If it does not advance easily, it is probable the trachea has not been properly entered and the needle must be repositioned for a new attempt. After the tubing has been advanced into the trachea, the needle is withdrawn, and the base of the tubing is seated into the hub of the needle.

Unless the patient is anesthetized, introduction of the tubing is frequently accompanied by severe coughing, which can be controlled if need be by

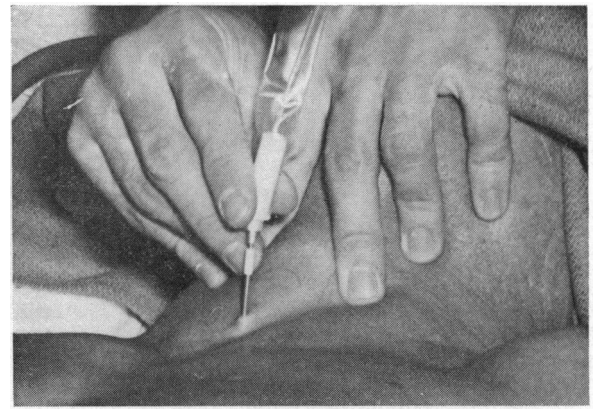

Figure 1.—A Bardic Intracath needle is being inserted into the trachea. The slight inclination of the needle toward the thorax will encourage a distal progression of the catheter.

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*Manufactured in U.S.A. for C. R. Bard, Inc., Murray Hill, New Jersey.

introducing a topical anesthetic agent through the tube. Within minutes after it is placed, the tubing warms, conforms to the tracheal configuration and becomes nonirritating.

A vigorous cough can be produced at will by introducing an irritant into the trachea through the indwelling catheter. We use Alevaire® (an aqueous solution of tyloxapol) for the purpose since it acts as a saponifying agent and is non-toxic. A bronchodilating agent, antibiotic or any other compatible substance may be added to the Alevaire. One milliliter of liquid instilled into the trachea every two hours is well tolerated, but often strong cough can be brought about with less than 0.5 ml.

Most recently a routine has been developed which combines the tracheal instillation with positive pressure therapy. Immediately following the usual aerosol treatment, the tracheal instillations are given to stimulate cough when it can be most effective. For prophylaxis, this regimen is usually carried out four times a day.

Although our technique was independently conceived, similar procedures have been reported by Radigan[2], Webb[3], and McCabe[1]. Webb has been using an experimental mucolytic agent, acetylcysteine, which he reports more effective than the agents in general use.

RESULTS

Fifty-five patients were treated postoperatively by the method described. In 38 the intent was prophylactic, the patients having been selected because of factors which were deemed to predispose them to a respiratory complication—age, history of previous pulmonary disease, heavy smoking habit or the nature of the operation. The needle was inserted at the completion of the operation, while the patient was still anesthetized. Alevaire instillations usually were begun as soon as the patient had fully recovered from the anesthetic. The frequency of the instillations varied from four times a day to as often as every two hours and extended over a period of from two to eight days, depending upon the clinical progress of the patient. In no case was anything else needed to keep the bronchial tree clear. Fever developed on the sixth postoperative day in one of patients being treated in this manner, and a roentgenogram was interpreted as showing middle lobe pneumonitis. Clinically, however, fever was the only symptom. The treatment was not discontinued but an oral tetracycline was added to the regimen and the pneumonic process, as visualized radiographically, subsided in three days.

In 17 cases the method was employed because of forthright indication of need—accumulating endobronchial secretions or clinical or radiographic evidence of pulmonary atelectasis or inflammation. In each instance, a vigorous effective cough was produced and the respiratory tract promptly cleared. We believe that tracheostomy was averted in some of these patients.

COMPLICATIONS

There were practically no complications. Considering the intricacy and vascularity of the paratracheal tissues, we anticipated occasional troublesome bleeding or hematoma following insertion of the needle, but neither occurred. We also were concerned with the possibility of infection about the tube tract, which would entail a threat of mediastinitis; but there were only four instances of infection and in all cases it developed in the fistulous tract during prolonged treatment. It remained well localized, suppurated little and subsided promptly.

The only significant complication occurred when a catheter spontaneously retracted into the paratracheal soft tissues and two instillations of Alevaire, 1 ml each, were made into the tissues of the neck. This caused transient pain, but no sequelae. We have since been careful that the catheter is firmly fixed to the skin at the puncture site.

Recognizing that the tip could be lost into the neck or trachea if the catheter should be accidentally transected with the sharp bevel of the needle, we bind the point of junction of needle and tubing with tape to prevent such a mishap.

CONTRAINDICATIONS

The therapy here described is useless of course for patients so debilitated that effective cough is beyond reasonable expectation. Relative contraindications are situations in which the catheter would pass through an operative area, opening a tract for possible contamination, or an area in which an existing pathologic state would be intensified.

McCabe[1] said that the use of this method is contraindicated in asthmatic persons, but we have used it successfully in patients with severe asthma. For a time, indeed, the technique was tried as a form of medical treatment for severe asthma and emphysema in the hope of removing obstructing mucus. The routine was soon abandoned because of the short duration of beneficial results.

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